

## Acknowledgments

The Watts Branch Watershed Study was prepared for the City of Rockville Department of Public Works by a project team consisting of the Center for Watershed Protection, Macris, Hendricks, and Glascock, Inc., and Environmental Systems Analysis, Inc.

This study could not have been completed without the collaboration, advice and support of the City's Mayor and Council, the City staff and the members of the Watts Branch Partnership. The authors and the City are indebted to the following:

### MAYOR AND COUNCIL OF ROCKVILLE

Mayor Rose G. Krasnow  
Councilman Robert E. Dorsey  
Councilman Glennon J. Harrison  
Councilwoman Anne M. Robbins  
Councilman Robert J. Wright

### CITY SENIOR STAFF

W. Mark Pentz – City Manager  
Eugene H. Cranor – Director of Public Works  
Burt Hall – Director of Recreation and Parks

### WATTS BRANCH STAFF TEAM

Susan Straus, Chief Engineer/Environment, Department of Public Works  
Lise Soukup, Project Manager & Civil Engineer, Department of Public Works  
Bowman Ferguson, Project Implementation Coordinator, City Manager's Office  
Kenneth Hartman, (former) Project Implementation Coordinator, City Manager's Office  
Michael Critzer, Parks Services Manager, Department of Recreation and Parks  
Todd Janeski, (former) Environmental Specialist, Department of Community Planning and Development Services

*The following City staff also reviewed or assisted in the study:*

Steve Mader, City Forester, Department of Recreation and Parks  
Philip Bryan, Superintendent of Recreation  
Karen Rawlins, Recreation Programs Supervisor, Department of Recreation and Parks  
Shanna Sizemore, Intern, Department of Public Works  
Kate Monk, Administrative Assistant, Department of Public Works  
The Neighborhood Resources Coordinators

## WATTS BRANCH PARTNERSHIP MEMBERS

The following people, in addition to many other participants, made invaluable contributions to the Watts Branch Study. Their advice, questions, and efforts to inform their neighborhoods resulted in a better watershed plan and created a true partnership for the Rockville community. The City greatly appreciates their time and thoughtful input to the study.

Don Ainsworth  
Sally Byrne  
Jim Carleton  
Carol Carter  
Bob DeGroot  
Flora Feldman  
Phil Franklin

Inke Gregor  
Harry Haraseyko  
Gerald Leighton  
Jane Mangum  
Dick Menzer  
Paul O'Brien  
Kathy Oehl

Jim Reschovsky  
Bill Ridgely  
Gary Soneira  
John Telesco  
Dottie Thoms  
Fred Thoms  
Robert Wright

## TABLE OF CONTENTS

EXECUTIVE SUMMARY .....	E-1
E.1 Background .....	E-2
E.2 Analysis .....	E-3
E.3 Recommendations .....	E-5
E.4 Watershed Education and Pollution Prevention Strategy .....	E-10
E.5 Watershed Indicator Monitoring .....	E-11
E.6 Implementation .....	E-11
SECTION 1. INTRODUCTION .....	1-1
1.1 Why Watersheds? .....	1-1
1.2 Rockville's Stormwater Management Program .....	1-3
1.3 Watershed Characterization and History of Development Patterns in Watts Branch .....	1-3
1.4 Watts Branch Geomorphic History .....	1-10
1.5 Impacts of Urbanization and the Influence of Impervious Cover on Stream Quality .....	1-12
1.6 Rapid Watershed Approach .....	1-13
1.7 Stormwater Retrofitting and Stream Rehabilitation .....	1-15
1.8 Scope of Study .....	1-16
1.9 Watts Branch Partnership and Stakeholders .....	1-17
SECTION 2. CURRENT WATERSHED CONDITIONS .....	2-1
2.1 Channel Evolution and Channel Enlargement .....	2-1
2.1.1 The Concept of Channel Enlargement .....	2-1
2.1.2 Results of Channel Enlargement Analysis .....	2-5
2.1.3 Management Implications .....	2-6
2.2 Stream Channel Conditions .....	2-7
2.2.1 Rapid Geomorphic Assessment .....	2-8
2.2.2 Rapid Stream Assessment Technique (RSAT) .....	2-10
2.2.2.1 Results .....	2-15
2.2.3 Conclusions From Stream Channel Conditions Assessment .....	2-20
2.3 Hydrologic Modeling .....	2-21
2.3.1 Background .....	2-21
2.3.2 Results .....	2-22
2.4 Watts Branch Water Quality .....	2-24
2.5 Planning Charette .....	2-26
2.5.1 Exercise #1 - Retrofit Ranking for Selected Subwatershed .....	2-26
2.5.2 Exercise #2 - Public Education and Outreach Program Development .....	2-27
2.5.3 Exercise #3 - Retrofit Design .....	2-28
2.5.4 General Comments From Participants .....	2-29

SECTION 3. STORMWATER RETROFIT OPPORTUNITIES .....	3-1
3.1 The Watershed Retrofitting Process .....	3-1
3.2 Watts Branch Retrofit Inventory and Assumptions .....	3-5
3.3 Ranking System .....	3-6
3.4 Priority of Sites Based on Ranking System .....	3-11
3.5 Recommended Stormwater Management Projects .....	3-14
3.6 Hydrologic Modeling Assessment of Priority Retrofit Sites .....	3-33
SECTION 4. STREAM, WETLAND, AND FOREST REHABILITATION OPPORTUNITIES .....	4-1
4.1 Stream Rehabilitation Opportunities .....	4-1
4.1.1 Description of Stream Rehabilitation Inventory .....	4-3
4.1.2 Ranking System .....	4-14
4.1.3 Priority of Sites Based on Ranking System .....	4-17
4.1.4 Recommended Stream Restoration Projects .....	4-22
4.1.5 Recommended Outfall Stabilization Projects .....	4-30
4.2 Wetland Management Plan .....	4-31
4.3 Forest Management Plan .....	4-34
SECTION 5. WATERSHED MANAGEMENT RECOMMENDATIONS FOR WATTS BRANCH .....	5-1
5.1 Watershed Assessment .....	5-1
5.2 Structural Watershed Rehabilitation Using a Subwatershed Management Strategy .....	5-3
5.3 General Recommendations for Implementation .....	5-8
5.4 Watershed Education and Pollution Prevention Strategy .....	5-11
5.4.1 Program Recommendations .....	5-12
5.5 Watershed Indicator Monitoring .....	5-13
5.5.1 Recommended Watts Branch Stormwater Indicators .....	5-14
5.6 Implementation Schedule .....	5-18
REFERENCES .....	Page R-1

### LIST OF TABLES

Table E.1	Recommended Subwatershed for Priority Implementation .....	E-7
Table E.2	Nonstructural Pollution Prevention Program Recommendations .....	E-10
Table E.3	Stormwater Indicator Profile Categories .....	E-11
Table 1.1	Some of the Important Aspects of Watersheds and Urban Streams .....	1-1
Table 1.2	Watts Branch Subwatershed Characteristics .....	1-6
Table 1.3	Stakeholders in the Watts Branch Watershed Management Process .....	1-17
Table 2.1	Summary of Channel Bankfull Data Under Current Conditions .....	2-5
Table 2.2	Ultimate Channel Enlargement Ratios and Cross-Sectional Area Assuming Full Watershed Build-out .....	2-6
Table 2.3	Summary of Channel Stability Assessment Using the Rapid Geomorphic Assessment Form .....	2-9

Table 2.4	ESA Modified RSAT Evaluation Method (Based after Galli, 1996) . . . . .	2-14
Table 2.5	Summary of Watts Branch RSAT Scores by Segment . . . . .	2-17
Table 2.6	Peak Discharges – Predevelopment Condition . . . . .	2-22
Table 2.7	Peak Discharges - Existing Condition with Existing Structures . . . . .	2-23
Table 2.8	Peak Discharges - Ultimate Condition with Existing Structures . . . . .	2-23
Table 2.9	Summary of Historic Watts Branch Water Quality, Macroinvertebrate, and Fish Data (Adopted from EA, 1997) . . . . .	2-25
Table 3.1	Basic Elements of a Stormwater Retrofitting Implementation Strategy . . . . .	3-3
Table 3.2	Some of the Best locations for Stormwater Retrofits . . . . .	3-4
Table 3.3	Retrofit Ranking Criteria . . . . .	3-7
Table 3.4	Retrofit Ranking Results . . . . .	3-12
Table 3.5	Stormwater Retrofit Sites Identified for Concept Design . . . . .	3-13
Table 3.6	Stormwater Management Concepts Summary Data . . . . .	3-31
Table 3.7	Peak Discharges – Existing Condition with Existing and Proposed Structures . . . . .	3-34
Table 3.8	Peak Discharges – Ultimate Condition with Existing and Proposed Structures . . . . .	3-34
Table 4.1	Watts Branch RSAT Project: Stream Rehabilitation Inventory . . . . .	4-6
Table 4.2	Watts Branch Stream Rehabilitation Ranking System by ESA . . . . .	4-14
Table 4.3	Watts Branch Revised Stream Rehabilitation Ranking System by City and Partnership . . . . .	4-17
Table 4.4	Simplified Stream Project Ranking System Raw Data . . . . .	4-18
Table 4.5	Stream Rehabilitation Sites: Descending Order Ranking by ESA . . . . .	4-19
Table 4.6	Stream Rehabilitation Sites: Revised Descending Order Ranking by City and Partnership . . . . .	4-20
Table 4.7	Stream Rehabilitation Projects . . . . .	4-21
Table 4.8	Summary of Recommended Reforestation Sites . . . . .	4-35
Table 4.9	Reforestation Species Recommendations . . . . .	4-36
Table 5.1	Recommended Subwatershed for Priority Implementation . . . . .	5-6
Table 5.2	Nonstructural Pollution Prevention Program Recommendations . . . . .	5-12
Table 5.3	Stormwater Indicator Profile Categories . . . . .	5-13
Table 5.4	Watts Branch Capital Improvement Project (CIP) Implementation Schedule . . . . .	5-19

## LIST OF FIGURES

Figure E.1	Watts Branch Cross-section Comparison . . . . .	E-4
Figure E.2	Watts Branch Subwatershed Analysis Map . . . . .	E-9
Figure 1.1	Vicinity Map for Watts Branch Watershed . . . . .	1-5
Figure 1.2	Watts Branch Subwatershed Naming Convention . . . . .	1-7
Figure 1.3	Watts Branch Current Land Use . . . . .	1-9
Figure 1.4	Historic photo (circa late 1950s) of Leopold investigation site . . . . .	1-11
Figure 2.1	Watts Branch Stream Enlargement Assessment Location . . . . .	2-2
Figure 2.2	Watts Branch cross-section comparison . . . . .	2-4
Figure 2.3	Photo looking downstream showing exposed manhole and enlarged channel . . . . .	2-4
Figure 2.4	Watts Branch Stream Nomenclature . . . . .	2-12
Figure 2.5	RSAT Sampling Locations . . . . .	2-13

Figure 2.6	RSAT Stream Reach Condition Rating Results .....	2-16
Figure 2.7	Summary of Watts Branch Riparian Conditions .....	2-19
Figure 3.1	Candidate Retrofit Sites .....	3-2
Figure 3.2	Priority Retrofit Sites with Associated Drainage Areas .....	3-35
Figure 4.1	Watts Branch Stream Restoration Sites .....	4-2
Figure 4.2	Wetland Improvement and Reforestation Management Plan .....	4-33
Figure 5.1	Subwatershed Analysis Map .....	5-7

## LIST OF APPENDICES

Appendix A	Channel Enlargement Theory and Methodology
Appendix B	RGA Forms
Appendix C	RSAT Report
Appendix D	Hydrologic Report
Appendix E	Retrofit Inventory Sheets
Appendix F	Record of Supporting Documentation Provided to City
Appendix G	Regulatory Agency Review Comments on Proposed Projects